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(54) **Mirror construction**

(57) A mirror construction, for reflecting and focusing solar radiation, includes a frame 3, at least one elongate concave mirror 2 which is rotatably mounted with respect to the frame 3 about an axis 1 which coincides with the focal line of the mirror 2, and an arrangement 7-11 for rotating the mirror 2. The arrangement 7-11 includes at least one auxiliary construction 7 which is mounted on the reverse side of the mirror 2 to the axis of rotation. The auxiliary construction 7 has an outer arcuate toothed portion forming part of a circle with the axis of rotation as centre, a respective gear fixed to a drive shaft 10 in a gear box 9 meshing with the teeth in order to rotate the or each mirror 2. A pipe 1 extends along the axis 1 such that fluid in the pipe is heated by solar radiation.

Fig.1

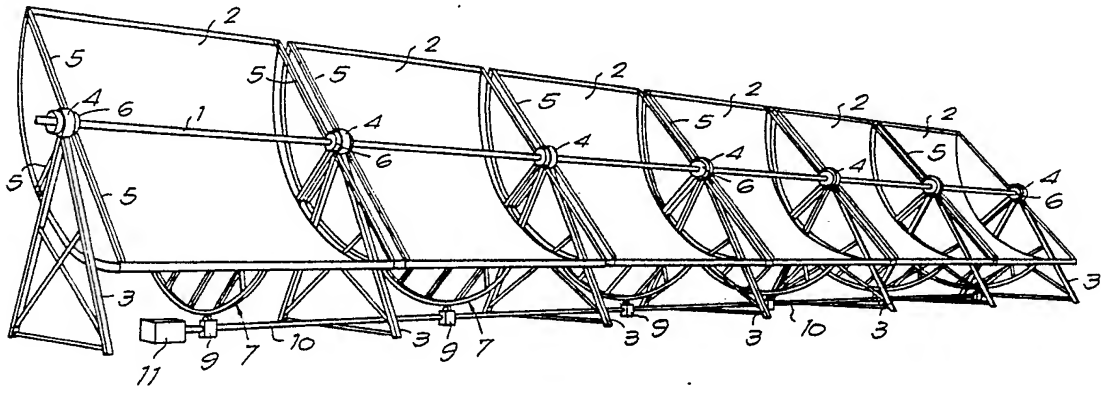

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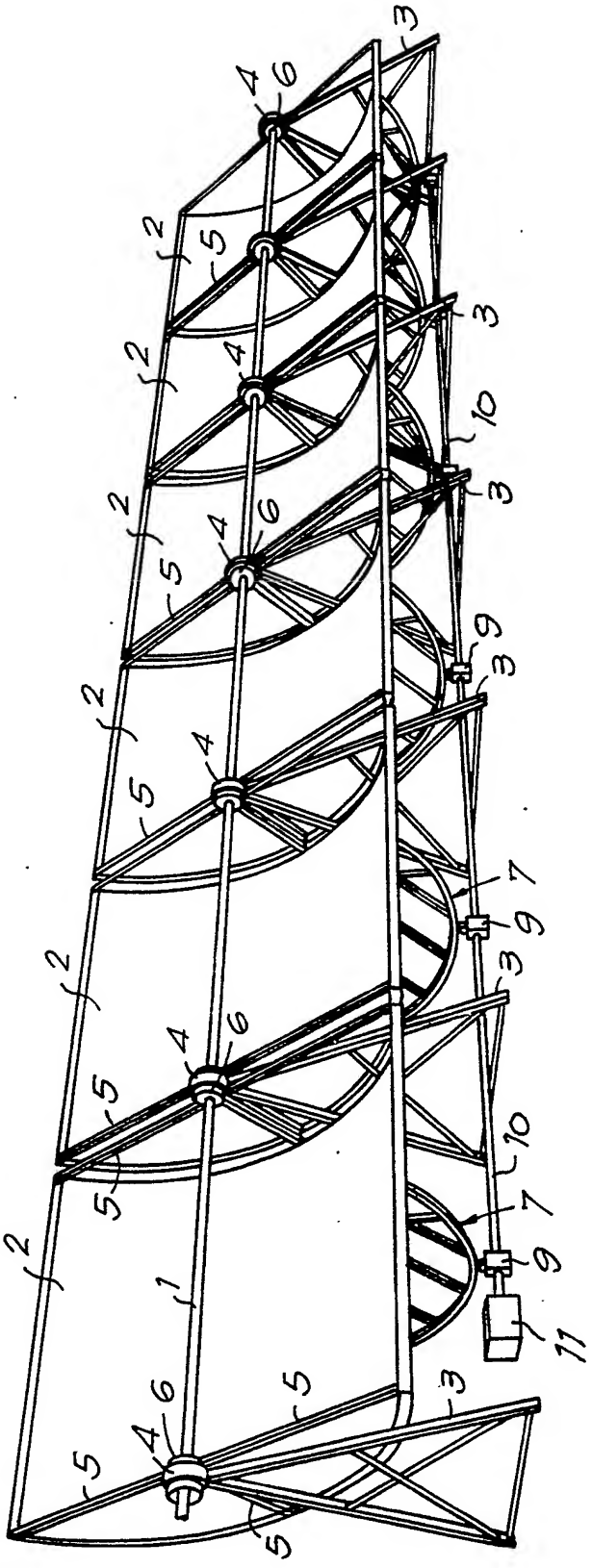
Fig. 1



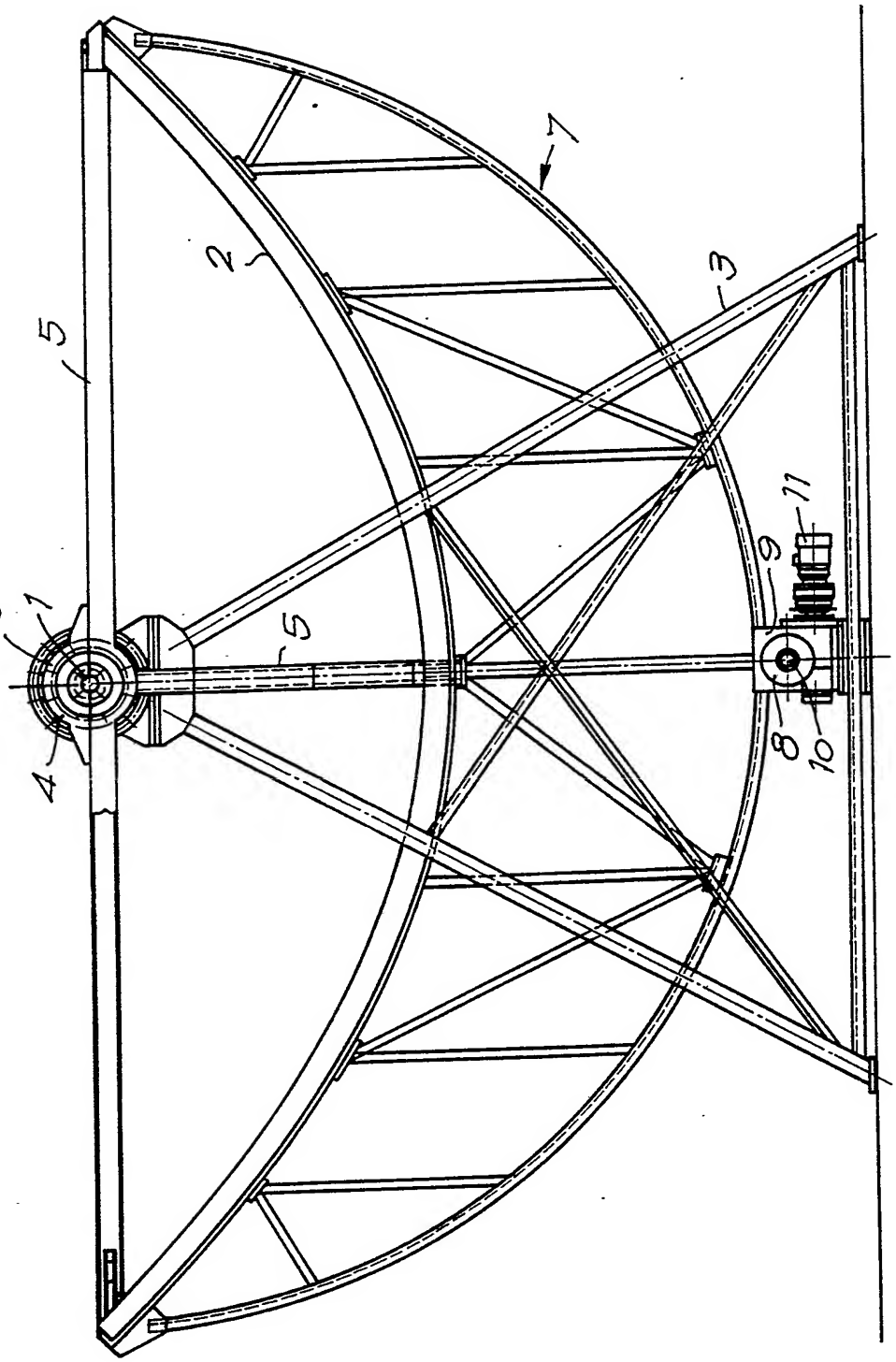


Fig.2

MIRROR CONSTRUCTIONS FOR REFLECTING AND FOCUSING SOLAR RADIATION

This invention relates to mirror constructions for reflecting and focusing solar radiation.

A known mirror construction includes a frame, at least one elongate curved mirror rotatably mounted with respect to the frame about a parallel longitudinal axis of the mirror, and means for rotating the mirror with respect to the frame.

Mirror constructions of this type may form part of solar heating devices whereby either a convex mirror or an object to be heated is positioned at the focal line of the mirror. In the first case, the convex mirror reflects the concentrated solar radiation through a split in a closed space, for example a compartment for raising plants. In the second case, the object to be heated is usually a pipe through which flows fluid to be heated, for example liquid sodium or steam, which fluid may then be used for driving of heat engines, turbines, or the like.

The mirror must be rotatable in order to be able to receive maximum solar radiation from different positions of the sun.

With this known mirror construction, the axis of rotation of the mirror is either located on the mirror itself, in its extension, or on the back of the mirror. This is among others the case with the mirror constructions described in Belgian Patent Nos 888 400 and 901 638. In the mirror construction described in Belgian Patent No. 901 638, for example, the mirror is a semiparabola and the axis of rotation is situated at the apex of this parabola.

The result is that, in these known mirror constructions, rotation of the mirror with respect to the frame causes the focal point or line to be moved. This can in many cases cause problems. If, for example, a pipe for fluid to be heated is installed at the focal line, then this pipe also moves with rotation of the mirror so that both extremities of the pipe must be connected to the remainder of the solar heating device by means of flexible connecting pipes which must also be able to withstand relatively high temperatures. Because of this, the construction becomes more complicated and expensive.

According to the present invention there is provided a mirror construction for reflecting and focusing solar radiation, the construction comprising a frame, at least one elongate concave mirror which is rotatably mounted with respect to the frame about a parallel longitudinal axis of the mirror, and means for rotating the mirror with respect to the frame, wherein the axis of rotation of the mirror coincides with the focal line of the mirror, and the means for rotating the mirror includes at least one auxiliary construction mounted on the reverse side of the mirror to the axis of rotation, the auxiliary construction having an arcuate portion forming part of a circle with the axis of rotation as centre.

A preferred embodiment of the invention described below provides a mirror construction for reflecting and focusing solar radiation in which, with rotation of the hollow curved mirror, the focal line remains in one place.

Since the focal line coincides with the axis of rotation, this also remains in its place with rotation of the mirror. The means for rotating the mirror can be produced very simply and also the supporting of the mirror can be achieved very effectively.

In a particular embodiment of the invention the mirror is curved in the shape of a parabola.

A mirror construction embodying the invention is particularly advantageous if the mirror construction contains a pipe for transporting fluid which extends along the focal line.

Other details and advantages will appear from the following description of a mirror construction for reflecting and focusing solar radiation, the description being given only by way of example with reference to the accompanying drawings, in which:

Figure 1 is a view in perspective of a mirror construction according to an embodiment of the invention; and

Figure 2 is a side view of the mirror construction shown in Figure 1, but drawn on a larger scale.

In the drawings, the same reference numerals relate to the same elements.

The mirror construction shown in the drawings is a solar heating device for heating fluid that flows through a pipe 1. The pipe 1 extends along the focal line of a series of six elongate concave

mirrors 2 which are curved according to a parabola in a sectional plane perpendicular to the focal line.

The mirrors 2 may for example each consist of a core of stiff foam plastic which is mounted in a frame and which is covered with a reflective covering on the reflecting side, such as a polished plate of stainless steel.

The mirrors 2 are carried by a frame that principally consists of seven vertical substantially triangular supports 3 which each carry a bearing 4 at their top vertex. Each mirror 2 is pivotally mounted between two neighbouring supports 3. For this purpose, each mirror 2 is attached at both extremities to a plurality of arms 5 which extend transversely from the sides of the mirror and which converge at the location of the focal line of the mirror on a round journal 6 which with one extremity is mounted on the bearing 4 of the respective support 3. Two of the arms 5 are situated in a single straight line and together extend between the outermost edges of the mirror 2. A third arm 5 extends perpendicular to the aforementioned two arms 5. Each journal 6 is provided with a central opening through which the pipe 1 extends so that the journal 6 can turn freely around the pipe 1. The pipe 1 is preferably supported by the journals 6. Each mirror 2 is, half way along its length, provided with an auxiliary construction 7 on its back which lies substantially in a plane perpendicular to the focal line of the mirror and which is formed out of an approximately arcuate outermost edge and a framework construction situated between this edge and the mirror. The arcuate outer edge of the construction 7 is centred on the focal line of the mirror. The outermost edge is provided with teeth on the outside. The teeth of this outermost edge mesh with a gear 8 that is fixed to a drive shaft 10 in a gearbox 9 mounted on the ground.

The drive shaft 10 which extends parallel to the axis of rotation of the mirror construction is common for all the gears 8, so that all the gears 8 are rotated at the same time and therefore all the mirrors 2 can be tilted at the same time.

The drive shaft 10 is in its turn driven by a motor 11 which is mounted on the ground on one extremity of the shaft.

The tilting of the mirrors 2 therefore occurs simultaneously in a very simple manner. All the mirrors 2 are very well supported.

Because the pipe 1 is situated along the focal line of the mirrors 2, then it does not change position during the tilting of the mirrors 2. Because the journals 6 can rotate around this pipe, the pipe 1 can be fixed so that its connection to the rest of a piped fluid circuit can be effected by means of fixed connections and therefore in a relatively economical and leak proof manner. The pipe 1 can move freely in the direction of its length in the journals 6 and can therefore freely extend and contract. The mirrors 2 can always be directed toward the sun. The solar radiation is reflected and concentrated on the focal line of the mirrors 2 which is coincident with the pipe 1, as a result of which the fluid that flows through it is heated. The pipe itself can for example consist of a metal tube which is surrounded by glass that allows the solar radiation through to the tube but limits the outward radiation of heat.

The invention is not restricted to the embodiment described above, and many changes can be made.

In particular, the mirror construction need not necessarily contain exactly six mirrors. It can contain any other number of mirrors, even only one mirror.

The means for moving the auxiliary constructions for tilting the mirrors need not necessarily include a gear wheel transmission. The transmission between the drive shaft and the auxiliary constructions can for example instead be effected by means of pulleys.

CLAIMS

1. A mirror construction for reflecting and focusing solar radiation, the construction comprising a frame, at least one elongate concave mirror which is rotatably mounted with respect to the frame about a parallel longitudinal axis of the mirror, and means for rotating the mirror with respect to the frame, wherein the axis of rotation of the mirror coincides with the focal line of the mirror, and the means for rotating the mirror includes at least one auxiliary construction mounted on the reverse side of the mirror to the axis of rotation, the auxiliary construction having an arcuate portion forming part of a circle with the axis of rotation as centre.

2. A mirror construction according to claim 1, wherein the mirror is curved according to a parabola.

3. A mirror construction according to claim 1 or claim 2, including a pipe for transporting fluid which extends along the focal line.

4. A mirror construction according to claim 1, claim 2 or claim 3, wherein the frame at both extremities of the mirror includes an upright support, a bearing is mounted on each support and a plurality of arms radiating from a journal connect on each extremity of the mirror, the journal being mounted on a respective bearing.

5. A mirror construction according to claim 4 when dependent on claim 3, wherein the pipe extends through the journals of the or each mirror, and the journals are rotatable about the pipe.

6. A mirror construction according to any one of the preceding claims, wherein a single auxiliary construction is situated half way along the length of the or each mirror.

7. A mirror construction according to any one of the preceding claims, wherein the auxiliary construction is provided with teeth on its outermost edge and the means for rotating the mirror includes a gear that meshes with the teeth.

8. A mirror construction according to any one of the preceding claims, including at least two elongate mirrors, each of the mirrors being associated with at least one respective auxiliary construction.

9. A mirror construction according to claim 8, wherein the rotating means is operable to act on at least a number of the auxiliary constructions for simultaneous movement thereof and simultaneous rotation of the mirrors attached thereto.

10. A mirror construction according to claim 9 when dependent on claims 7 and 8, wherein the rotating means includes a drive shaft extending parallel to the axis of rotation of the mirror construction, a motor for driving the drive shaft, and a gear for each mirror attached to the drive shaft and which meshes with the teeth of the respective auxiliary construction.

11. A mirror construction substantially as hereinbefore described with reference to the accompanying drawings.

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DERWENT-WEEK: 199220

TITLE: Mirror construction has at least one elongate concave mirror rotatably mounted w.r.t. frame about axis coinciding with focal line of mirror

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BASIC-ABSTRACT:

The mirror construction includes a frame (3) at least one elongate concave mirror (2) which is rotatably mounted with respect to the frame about an axis (1) which coincides with the focal line of the mirror and an arrangement (7-11) for rotating the mirror. The arrangement includes at least one auxiliary construction (7) which is mounted on the reverse side of the mirror to the axis of rotation.

The auxiliary construction has an outer arcuate toothed portion forming part of a circle with the axis of rotation as centre, a respective gear fixed to a drive shaft (10) in a gear box (9) meshing with the teeth in order to rotate the or each mirror. A pipe (1) extends along the axis (1) such that fluid in the pipe is heated by solar radiation.

USE - For reflecting and focusing solar radiation. Dwg.No.1/2)@

TITLE-TERMS: MIRROR CONSTRUCTION ONE ELONGATE CONCAVE ROTATING MOUNT FRAME AXIS COINCIDE FOCUS LINE

DERWENT-CLASS: P81 Q74

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 1991-058581